



RISK RELATED BEHAVIOR OF THE YOUTH, USING NATURAL RADIATION AND SOLARIUMS WITH DIAGNOSED NEVI

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Introduction

Solar radiation is the most frequent environmental factor influencing the skin, where responsibility for harmful properties are of the ultraviolet radiation [1]. Chronic and excessive exposure to solar radiation often leads to adverse early effects such as erythema, sunburns or latter symptoms of accelerated skin ageing or even post-solar carcinogenesis. It was proven that excessive exposure to ultraviolet radiation significantly increases the risk of occurrence pigmented or non-pigmented skin cancers – melanoma or squamous-cell cancer [2,3]. UVB radiation of wavelengths 280 – 315 nm is 5 % of UV radiation reaching the surface of the Earth, the rest is UVA radiation [1]. The accumulation of DNA damage by UV rays is mutagenic in complex way, by damaging tracts leading to apoptosis of damaged cells and promoting proliferation of changed, immature cells. Under the influence of UV radiation, by “creation of pyrimidine dimers – thymidine dimers or thymine with cytosine and 6.4 photoproducts leads to damage of DNA of epidermis cells” [4]. Direct mutagenic effect with local immunosuppression in skin is mainly through influence of UV radiation B type, which is around 1000 times more mutagenic than UVA, but UVA radiation also indicates direct contribution in damaging of DNA cells [5,6,7,8,9]. Cancerous effect is observed through artificial tanning. Emitted radiation levels of UVA used in solar lamps are significantly higher than those of natural exposure to sunlight, which may cause impairment of self-defense mechanisms. Scientific research concerning the influence of artificial sources of UV radiation on development of skin cancer showed that frequent and longer usage of tanning beds increases the occurrence of melanoma or squamous-cell cancer. As a result of numerous research International agency for Research on Cancer in 2009 classified the radiation emitted by solar lamps as carcinogen factor for skin cancer, equally with other carcinogens, such as arsenic compounds, coal tar and soot [3,5,6,7,8]. The fact that the youth is using tanning beds and excessive exposure to sun is worrying, as the mass media creates the image of tanned skin as “fashionable” and attractive [3].

Objective

The aim of the work is to analyze risk behavior of the youth using natural radiation and tanning beds with diagnosed nevi.

Material and methods

The research was carried among 500 people residing on the territory of Podkarpackie Voivodship. The age of test subject ranged between 18 to 25 years, with average age 23.96 ± 0.84 (range [18;30], median 25.95 %CI [18.9;24.01]). The age structure is following: the biggest group are people between 19 – 22 years and the percentage is 90 %, subjects between 23-25 years are 10 % of total. Most respondents reside in rural areas and the percentage is 70%, whereas people living in urban areas constitute 30%. The test group consisted of 93 % women and 7 % men. Preparation and research was carried from 2011 to 2014.

To acquire the research material for the work, physical examination was conducted to assess the occurrence of skin lesions, dermatoscopy to assess nevi and skin changes, standardized questionnaire form including questions to spontaneous and supported answers.

All statistical calculations were completed by using statistical bundle StatSoft, Inc. (2011). STATISTICA (Data analysis software system), version 10.0 www.statsoft.com., statistical bundle R version 2.15.1 and Excel spreadsheet. Quantitative variables were characterized by arithmetic mean, standard deviation, median, minimal and maximal value (range) and 95 % CI (confidence interval). Qualitative variables were presented by numerosness and percentage values (in percent). Statistical analysis used following tests: Shapiro-Wilk, Leven (Brown-Forsythe's), Student's t-distribution, Mann-Whitney U, F (ANOVA), Kruskal-Wallis.

Results

Physical examination proved the occurrence of nevi with 68 % of test subjects, where after dermatoscopy 25 % of changes indicated worrying cancerous features and further dermatological examinations were recommended (page 1-7). All subjects (100 %) with pigment changes have sunbathed or used tanning bed at least once in a lifetime, and over a half (68 %) were sunburned through UV radiation. By researching the occurrence of cancerous diseases in families within the

test group, such burden was observed with 55 % of subjects, with 40 % no cancerous disease was observed. People with no equivocal stand in this matter are 5 % of total.

Interviewees using natural tanning and tanning beds are a majority and the percentage equals 72 %. Among people using tanning beds, half (50%) use tanning beds rarely, 46 % use them occasionally, and 4 % use them systematically. Interviewees, when asked about the average number of annual visits answered in one of three ranges. The biggest number of people, 75 % indicated to be visiting tanning beds 1 – 5 times yearly, 18 % answered to be using 10 – 15 sessions yearly. People using tanning beds of over 15 times yearly constitute the smallest number of only 7 % respondents. The most preferable time range for using tanning beds is 5 -6 minutes, with 54 % of respondents, 9 – 11 minutes with 25 % interviewees, and the rest 21 % tans for 7-8 minutes. No interviewees indicated tanning of more than 12 minutes. For a question of possible personal advice and adjusting time for individual complexion by tanning solarium personnel, 36 % answered positively. The same percentage do not provide any conclusive answer and 28 % do not get any advice. Interviewees, when asked about the importance of new, installed lamps, 68 % believe that new lamps make the solarium more attractive and increase the quality of services. A different view of 32 % interviewees, treat such information as a threat of possible skin burns. Respondents asked about possible knowledge of solarium's personnel towards the negative effects of tanning, 57 % gave inconclusive answer. 25 % of respondents believe that solarium's personnel does not have appropriate knowledge about the tanning effects in solarium. The fewest representation of respondents of 18 % believes that personnel does have the necessary knowledge of the tanning effects in solarium. 54 % of the interviewees believe that employees of solarium do not inform their customers about possible effects of tanning in solarium. People with inconclusive answer constitute about 25 % of the respondents. People, who received information about negative effects of tanning are the fewest representation of respondents with percentage of 21 %.

Over one half (68 %) is aware of the harmful effects of UV radiation, the rest of 32 % does not have such knowledge. By testing which source of information influenced the awareness of respondents towards the harmful effects of natural and artificial radiation, the most was Internet (70 %) and other media (23 %), whereas the solarium personnel was a source to 7 % of respondents. Researching the pro-healthy behavior of the group, the question concerning the protection of nevi against UV radiation. 42 % of respondents use special sunscreens, 33 % by putting plaster and 25 % does not use any protection. Among the test group due to UV radiation new nevi occurred with 17 %.

Most interviewees (67 %) believe that using natural radiation and tanning is more harmful, whereas 33 % believe it is beneficial. Among beneficial effects of tanning, respondents most frequently indicated improved image (72 %), form of relaxation (21 %) and healthy concerns (8 %). Easy access to solarium in place of residence is with 31 % of interviewees, the rest of 69 %) does not have solarium in the place of residence.

Solarium users are prone to the risk of possible burn. By researching this issue, high percentage of interviewees never experienced the burns in solarium (79 %). By 14 % burns occur only occasionally. People who are burnt nearly always after using solarium, constitute 7 % of the test group. Observation of the skin during tanning shall prevent the undesirable effects of tanning. 71 % of the group observes the skin and nevi.

Researching the decision making process for tanning in solarium, most respondents - 68 % answered that this was their individual decision. The rest of interviewees, 32 % claimed that such decision was after colleague's suggestion.

The question whether tanning in solarium is acceptable by the society, 53 % of respondents answered that society accepts the tanning in solarium. 47 % answered against. Interviewees, asked about their parents' usage of solarium answered negatively in 97 %. Subjects whose parents use solarium are with 3 %. Alternating tanning in solarium and naturally with short period of time is a risky behavior among many young people. By researching this group, most of them

(82 %) denied such behavior. The group of 18 % answered that is using solarium and natural tanning in a short periods of time.

Testing subjects' knowledge concerning emissions of radiation in solarium such question was asked. Half of the respondents (50 %) does not give conclusive answer, slightly fewer 42 % believes that tanning process in solarium is connected with UVA and UVB radiation. By 8 % of respondents tanning in solarium means emission of UVA and UVB radiation. Undesirable effects of tanning are destruction of collagen fibers and permanent discoloration on the body. Such knowledge is with 85 % of the subjects, 15 % indicated hair loss and nail fragility as undesirable effects of tanning. Asked about the number of phototyping tones (6 tones) 38 % of respondents were right. Most interviewees (41 %) believe that modern medicine has 4 tones, 5 tones is differentiated by 21 %. People of tone I and II are specially prone to sunburn, so they should be careful in using sun or solarium tanning. By researching which phototyping tone is least resistant to UV radiation, most interviewees (61 %) provided correct answer. The group indicating tone III were with 17 % and for tone IV 22 %. Solar radiation is especially dangerous between 10 am to 3 pm. Appropriate knowledge is with 43 % of test group, the young people indicating the time between 11 am and 1 pm of 38 %, and by 19 % the most harmful time is between 12 pm and 4 pm. People using solarium are tanned very quickly in a very short period of time. The long intervals between tanning are important – the correct timing is 2 or more days. Such behavior is with 84 % of respondents, the rest of 15 % fails to take any notice. Among the respondents appropriate sunscreen is used by 79 %, whereas 21 % do not use it. The quality of protection is influenced by appropriate usage of sunscreen to individual phototype tone of skin. Appropriate matching of sunscreen with individual phototype is done by 29 % of respondents, and 71 % do it incorrectly.

The factors of increased risk for melanoma are numerous occurrence of nevi, red hair, light complexion, no predisposition for tanning. Interviewees of 89 % knew the factors causing melanoma. The group of 9 % indicated following factors: mechanical injury of ski, excessive sweating and cardiovascular diseases. By 2 % of respondents it is lack of nutrients, dry skin and low temperature influence the occurrence of melanoma.

Using sunscreen protection during solarium tanning

Analyzing such dependency, it may be noticed that people using solarium and sunscreen protection are majority and constitute 78.6 %. Test group not using any type of protection during solarium tanning is 21.4 %. Similarly high percentage of people using sunscreen, but not using solarium is 77.8 %. Interviewees of 22.2 % do not use UV sunscreens nor solarium tanning. Based on the analysis it may be stated that: "the number of young people using solarium tanning with sunscreen protection is higher than the number of young people not using protection against radiation."

The frequency of skin burn occurrence after solar and solarium tanning

By comparison of frequency of skin burns of solar or solarium origin, the respondent group of 78.6 % never experienced sunburns after using solarium, and 35 % never experienced sunburns after solar tanning.

Analyzing furthermore, 60 % of respondents admit to be sometimes sunburned after solar exposure, and only 14.3 % admits to be sometimes sunburned after solarium. Sunburns always occur after natural tanning are 5 % and with people using solarium 7.1 %.

Comparing burns in solarium and in natural sun it can be observed that significant part of 78.6 % replied to be never burnt in solarium and only 35 % respondents were never burnt by sun. Sunburns that sometimes occurred with respondents are the highest for natural tanning and totals nearly 60 % whereas solarium sunburns are only 14.3 %. People who are always sunburned are similar in number and it is 5 % of students tanning naturally and 7.1 % tanning in solarium. Based on analysis it can be stated that: "The youth are most commonly sunburned through exposure to natural radiation."

The influence of public opinion on health related behavior of the young people

Analyzing the influence of public opinion for using solarium, it was stated that the group of 20 % people whose background support solarium tanning, use it systematically. The percentage of the people of 69.2 % uses solarium systematically. People who rarely use solarium are 64.3 %. The results are different with people whose background do not support tanning in solarium. The group of 80 % of people use solarium systematically. Occasional tanning is for 30.8 % of interviewees, with very rare tanning in solarium within the group of 35.7 %.

It may be stated that: "majority of people use solarium systematically even though there is no support of solarium tanning by the public."

The influence of parents who are using solarium for health behavior of the young people

Analyzing the over-mentioned dependency, parents and their children using solarium are 7.1 %. For parents who use solarium tanning, the children not following their footsteps constitute 1.4 %. The group of parents and their children who do not use solarium is 98.6 %. The percentage of 92.9 % is the group of

young people who are tanning against the negative behavior of their parents. It may be stated that: "Parents' tanning in solarium influences the same behavior of their children."

The influence of appropriate usage of UV sunscreen on the number of sunburn occurrence

The dependency presented below shows, that students who can appropriately select and use sunscreen were never sunburned and the percentage equals 44.4 %. People who are sometimes sunburned but who can also select sunscreen for their own phototype are 20 %. Sun related burns co-occurring with correctly applied sunscreen for protection are 40 %. Inappropriate usage of UV sunscreen by the test group without sunburn concern 55.6 %. The group of 80 % of people is sunburned due to inappropriate usage of UV sunscreen. Inappropriate sun protection nearly always leads to sunburns with 60 % of interviewees. Considering the over-mentioned: "The knowledge concerning protection may prevent solar and solarium tanning related burns."

Discussion

Most commonly observed malignant skin cancer is BBC – Basal Cell Carcinoma, which constitutes of 80 % of all malignant cancerous lesions of the skin, second common is SCC Squamous Cell Carcinoma. Malignant skin cancer incidence in Poland between 2002 – 2012 indicated higher occurrence for both women and men. In 2012 incidence in women was 6719 cases and 5889 with men, mortality rate for women was 128 and 184 with men. The most dangerous skin cancer was MM – Malignant Melanoma observed with 1.5 – 2 % of all skin cancer cases. In Poland standardized incidence rate of malignant melanoma in 2012 was 5/100000, which totals around 3100 cases annually. It is most common cancer with women of 25-29 years of age and second common for women of 15-29 years of age. Residents of Queensland, Australia have the highest rate of malignant melanoma (with 40 – 60 cases per 100 k residents per annum), in the USA the incidence rate is 10 – 20 cases per 100 k residents per annum [10,11,12,13].

There are many various risk factors of malignant melanoma. The most important include lowered number of skin pigments, red or light hair, long-term intermittent exposure to sun with coexistent sunburns and blisters. There is a significant role of tanning in solariums, popular phenomena, especially among young people. IRAC, International Agency for Research on Cancer named the most important risk factors: the age when exposure to UV starter, frequency and timeframe. The longer tanning time, the higher the risk. Moreover, the increased incidence of malignant melanoma occurs with people of up to 45 years of age, who at least once used solarium tanning for minimum of 20 minutes. Based on meta-analysis IRAC of 2009 it was stated that with people vulnerable to artificial UV radiation, the relative risk of developing malignant melanoma is increased even by 75 %. In 2009 WHO and IRAC placed tanning equipment that emit UV radiation in the highest group of carcinogen factors, next to tobacco, asbestos or radioactive substances [10,13]. Meta-analysis completed of 19 reports of three continents showed that there is correlation between using solarium and increased incidence of malignant melanoma [14,15]. Another research presented by Autier P. (2004) prove that in the population of women in Norway and Sweden the risk of malignant melanoma incidence increases after regular visits in solarium [15,16], in Belgium, France, Holland and Great Britain and Northern Ireland, new cases of malignant melanoma were observed, with 53 % of incidences of people using solarium [17]. In 2000, Westerdahl al. by analysis of 571 patients diagnosed with melanoma, stated significant increase in the risk of developing malignant melanoma with people using artificial UV radiation. The relation between the dosage and melanoma development, the number of tanning sessions and increased risk with people who started using solarium before 36 years of age [18,19]. Factors favoring occurrence of melanoma are pigmented or dysplastic nevi. Presence of dysplastic nevi is connected with higher risk of malignant melanoma, especially with younger people, and the risk of developing malignant melanoma throughout the lifespan is close to 100 %. Inborn nevi of large area are characterized by higher risk of transforming into malignant stage, in this case the risk of developing malignant melanoma is heightened by 10 % throughout life [10,11,12,13]. The research conducted in Norway and Sweden on women's population between 30 – 50 indicated that the threat of developing malignant melanoma increases when there are asymmetrical nevi and there were skin sunburns before 30 years of age [14,15]. Own research showed that interviewees using natural sun and solarium are majority and the percentage equals 72 %, whereas research carried between 2012 – 2013 UV radiation related risk factor for young people was 16.5 % but the solarium only 2 % of total number of test subjects [20]. To reduce the risk of developing skin cancers the preventive actions must be undertaken. In accordance with statistical data, early diagnosis of malignant melanoma leads to nearly 90 % of total recovery [21]. Preventive measures include activities to reduce the number of incidences of malignant cancers by propagating healthy lifestyle and pro-healthy education, propagating preventing screening and early diagnosis [22,23]. Preventive activities for skin cancer includes decreased exposure to ultraviolet radiation, especially important in childhood and adolescence. The best method of reduction exposure time to ultraviolet is avoidance solar radiation in the hours of its highest activity, between 10 am and 3 pm, wearing appropriate clothes, and in time of exposure wearing appropriate sunscreen, absorbing UV radiation of over 15 (SPF >15) [24,25,26]. For preventive activities, application method is important as it influences its efficacy. The amount and permanence after application is vital. It is assumed that "appropriate

application of 2mg per 1 cm² of body area, which means around 2–3 g on adult's face and around 10 g on child's body"[27]. By researching health related behaviors of the group 42 % respondents protects themselves by using sunscreen. Research carried by K. Torzewska (2014) showed that protective eyewear is used by 18 %, sunscreen is used by 35 % with 27 % uses special sunscreen for direct sun exposure. Most respondents (51 %) do not use any cosmetics. Skin nevi is always protected by merely 10 % and 39 % respondents do it sometimes [28].

It is assumed that change of inappropriate healthy behavior may be influenced by informative actions in the mass media directed at the public, just as education activities [19]. Many countries introduced programs presenting harmful effects of solar radiation and protective measures. In Poland the major program concerning promotion of pro-healthy activities is National Program of Cancerous Disease Prevention for 2006–2015. The program includes activities leading to elimination or limitation environmental risk factors of exposure to solar radiation through education of society. Presently many countries recommend dissemination of knowledge of potential dangers of solarium tanning, and undertaking activities of not only pro healthy education but activities of pro healthy policy to introduce law regulations limiting the emission of radiation. In the United States very strict laws were introduced to ban tanning bed usage by the youth, in some states up to 18 years of age without prior consent of the guardians. The legal Act of forbidding the usage of solarium by minors was introduced in Germany. In 2009 solarium were liquidated in over 100 gyms in Sweden, Norway, Denmark and Finland. The action is supported by the Swedish Institute of Radiation Protection, which is favoring the introduction of banning usage of solarium for people under the age of 18 [19]. The own research shows that over half of respondents (68 %) is aware of the harmful effects of UV radiation, and the most information is gathered from Internet (70 %) which is confirmed by research of K. Torzewska (2014), where the source of information was indeed Internet, TV and press (46 %). The research of Zalewska and Cyłkowska-Nowak also indicated media as the most important mean of providing knowledge on preventing skin cancers [28,29]. Completely opposite results by the view of the youth's knowledge on pro healthy behavior were gained by research of Krajewska-Kula E. et al. (2011) it was concluded that the knowledge of the young people on using solarium, healthy tanning and negative effects was unsatisfactory. By the research, 60 % of respondents did not know what "the phototype tone of skin" is, tanning in solarium was considered less harmful than solar tanning by 29.1 % interviewees and most of the test group (60 %) believed in no negative circumstances of using solarium by the children and the young people. Negative effects of solar radiation could not be named by 47.3 % of interviewed [30].

Lack of prevention programs dedicated to young people and no legal regulations in Poland towards solar and artificial tanning, poses great challenge for public health. Lack of knowledge and awareness of the effects of uncontrolled tanning, constitutes the greatest threat of developing malignant skin cancers, especially with young people in the time of the biggest possibility of development and reproduction.

Conclusions

1. The interviewees' opinion is that tanning brings more loss than gains.
2. Using sunscreen during solarium tanning is of importance for majority of test subjects.
3. Majority of interviewees believe that natural tanning was the cause of more frequent sunburns than solarium tanning.
4. Majority of the youth is systematically using solarium tanning without the consent of the public.
5. People who tan naturally and concurrently appropriately select and apply sunscreen to their skin tone, are less sunburned.

Conflict of interest

The authors declare no conflict of interest.

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